CONNECTICUT RIVER FLOOD CONTROL

FARMINGTON RIVER BASIN

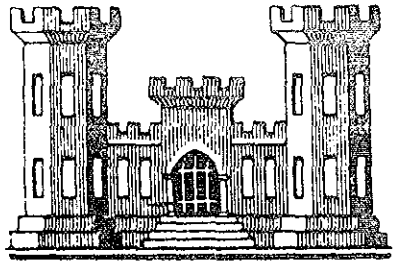
SUCKER BROOK
DAM AND RESERVOIR

SUCKER BROOK, CONNECTICUT

DESIGN MEMORANDUM NO.9

GENERAL DESIGN

HIGHLAND LAKE DAM MODIFICATIONS



U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

PREPARED BY
STATE OF CONNECTICUT
WATER RESOURCES COMMISSION

JANUARY 1966

9

STATE OF CONNECTICUT

WATER RESOURCES COMMISSION

STATE OFFICE BUILDING · HARTFORD 15, CONNECTICUT

December 23, 1965

U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts

Gentlemen: Attention: Mr. John William Leslie

Enclosed is a design memorandum on Modification of Highland Lake Dam which should fulfill the current requirement of cooperation on the Sucker Brook Flood Control Project in Winsted. We believe that this design memorandum is in accordance with the House Document and will be acceptable to the Chief of Engineers being in accordance with the results of our October 14th discussion in the Office of the Chief of Engineers and our further discussion of the draft in your office.

In accordance with these agreements this memorandum is submitted with the understanding that your review will take into account any geological or structural information that your office may have obtained through its explorations and study. You will recall that it had been agreed that there was no need of our duplicating such work as long as it was understood that your review would provide due consideration to these matters.

In accordance with the interpretation of the House Document the structural changes in the Highland Lake Dam are only meant to preserve the integrity of the structure and do not attempt to provide any control of the flood flow in Highland Lake stream other than now exists. Under these conditions it is not practical to design channel improvement work for Highland Lake stream. Therefore, the contemplated modifications are designed so that if and when additional upstream storage is provided further spillway modification can be performed to provide flood protection below Highland Lake Dam with a minimum of wasted expenditure.

It is assumed that any minor modifications in this design memorandum necessary to meet specific requirements of the Chief of Engineers can be accomplished by minimum revision at the time of final design. We appreciate the cooperation of your office in the solution of this problem.

DEC 27

Very truly yours,

William S. Wise

William S. Wise
Director

JJC/h

HIGHLAND LAKE DAM MODIFICATIONS

WINSTED, CONNECTICUT

CONNECTICUT RIVER BASIN

DESIGN MEMORANDUM NO. 9

GENERAL DESIGN

CONTENTS

LIST OF PLATES

LIST OF TABLES

DESIGN MEMORANDUM

Modification to Highland Lake Dam
Winsted, Conn.

1. General - There are presented herein the basis for design of certain modifications to Highland Lake Dam in Winsted, Connecticut, which will be undertaken by non-federal interests in conjunction with construction of the Sucker Brook Dam and Reservoir by the U. S. Army, Corps of Engineers. Local cooperation required by the Corps in connection with the Sucker Brook Project (House Document No. 443, 86th Congress 2nd Session) states that local interests will ".....e. modify Highland Lake Dam in a manner satisfactory to the Chief of Engineers to provide additional flood protection for Winsted.....". Based on discussions between the Connecticut Water Resources Commission and representatives of the Corps of Engineers from the New England Division and Office of the Chief of Engineers, it was mutually agreed that:

   a. Additional flood protection to Winsted is defined as protection against sudden structural failure to Highland Lake Dam which would release a surge of impounded water.

   b. Modification to the existing dam would consist of those measures deemed necessary to maintain the integrity of the dam after construction of the authorized Sucker Brook Project.

   c. The design flood for modification to Highland Lake Dam would be based on the reduction in runoff afforded by eight inches of flood control storage in Sucker Brook Reservoir.

2. Description of Highland Lake and Dam - Highland Lake is a long narrow lake, located to the southwest of the Winsted business center and a short distance downstream from the Sucker Brook Dam site. The lake, comprising approximately 0.7 square miles of surface area, is currently used primarily for recreation with provisions for power generation at the Union Pin Company, located immediately downstream. The present lake was formed by construction of a small earth and masonry dam located at the northerly end. The dam was reportedly constructed about 1860 and some time later raised about six feet by the Town to its present height. The dam consists of a vertical masonry wall four to eight feet in height forming the downstream face, with earth fill providing a 40-foot top width and upstream face sloping 12 horizontal on one vertical. The uncontrolled spillway consists of two depressed overflow sections which are paved as part of the roadway surface of West Lake Street. The upstream portion of the easterly spillway section and portions of the upstream face of the dam have rock slope protection. The upstream portion of the westerly spillway is used as a beach area and is covered by a shallow layer of sand. A small gated outlet located to the east of the easterly overflow section controls releases to Union Pin Company through a 4.5' x 6' stone arch conduit situated in the dam. Two separate discharge channels, which accommodate the discharge from the spillways during periods of overflow, converge to form Highland Lake Stream Channel, a short distance downstream from the dam.

About 2,000 feet southeast of the dam in the vicinity of Hurlbut and East Lake Streets, there is a low topographic saddle which was subjected to overflow during the August 1955 flood. Photographs of the dam are appended to this memorandum.

3. Description of the Watershed - The Highland Lake Stream Watershed is characterized by rugged, steep-sided ridges and relatively narrow valleys modified by glaciation. The geology of the area consists generally of a thin glacial till blanket overlain by outwash sand and gravel forming terraces and flood plain. Bedrock outcrops are relatively extensive, consisting of schist, gneiss and granites. Highland Lake and Crystal Lake are the major bodies of water with several smaller lakes in the higher elevations of the watershed. The drainage area above Highland Lake Dam is approximately seven square miles of which 3.4 square miles are drained by Sucker Brook. The authorized Sucker Brook flood control dam and reservoir will be constructed at a site just upstream of Wakefield Boulevard, near the mouth of Sucker Brook. The entire area upstream of Highland Lake presently drains directly into Highland Lake Stream, an extremely steep gradient watercourse between the dam and its junction with Mad River. (See Plate No. 1.)

4. August 1955 Flood - The flood of August 1955 at Highland Lake Dam far exceeded any known flood since the community was established in

the 1700s. The flood resulted from unprecedented amounts of rainfall of Hurricane Diane falling on the rugged topography of the seven square mile watershed. The estimated peak inflow to Highland Lake was approximately 6800 cubic feet per second representing a unit rate of runoff of 972 c.s.m. from the watershed. The maximum pool elevation in Highland Lake was 885.8 feet, msl, causing flood waters to overtop the dam and the low topographic saddle at the southeast periphery of the lake near East Lake and Hurlbut Streets. Critical elevations, as shown on Plate No. 2, are 882.3 and 882.6 at the east and west depressed overflow sections, respectively; about 884 at the abutments of the overflow section; and 885.4 at the topographic saddle. The August 1955 peak outflow was computed to be 4000 cubic feet per second, representing 571 c.s.m. from the watershed. The difference between the peak inflow of 6800 cfs and peak outflow of 4000 cfs is attributable to the extensive storage in Highland Lake. Based on available information, one foot of stage increase, near normal lake level, represents about 390 acre feet or one inch of runoff from the seven square mile gross watershed area. Although the August 1955 flood overtopped the dam and caused extensive damage downstream, no significant structural damage to the dam occurred.

5. Present Condition of Dam - Numerous field examinations of the dam were made by the Water Resources Commission and their consulting engineers during the past ten years. The most recent inspection was

performed by the firm of Dewey & Kropper Engineers in October 1965 as part of this investigation. At the time of inspection, the lake level was approximately elevation 880 feet, msl. There was evidence of minor seepage downstream from both overflow sections but no indication of piping of fines from the structure was apparent. The conduit through the dam consisting of a stone arch was inspected from within and found to be in sound condition. The gate structure, recently repaired by the City, was found to be in good condition and operable. Similarly, the road surface across the dam and depressed overflow sections was in satisfactory condition. While no construction plans of the dam were obtainable, the visual inspection indicated the structure to be stable. It is noted that no major repairs to the dam were required after overtopping by the August 1955 record flood flows and the recent inspection did not disclose any apparent structural weakness of the dam and appurtenances. In view of the foregoing and the reduced likelihood of major flood flows, after construction of the authorized Sucker Brook Project, it is the consultant's opinion that the present dam will not constitute a hazard by reason of sudden failure. It is recognized that the present dam does not meet current standards for design of new dams and therefore certain modifications are recommended to upgrade the existing structure. Geologic investigations were conducted by the Corps of Engineers in 1957. The locations of the borings were delineated on Plate No. 2 and the geologic logs are shown on Plate No. 6.

6. Project Design Flood - A comparison of the Standard Project Flood (previously computed) with the August 1955 flood indicated they were of the same relative magnitude. In view of this comparable magnitude, a somewhat larger flood was developed to serve as a basis for design of Highland Lake Dam modifications.

   a. Project Design Storm - The Project Design Storm (PDS) rainfall values were predicated on the standard project storm determination described in Civil Engineer Bulletin No. 52-8 and increased by 25%. Assuming an initial and infiltration loss rate of 0.05 inches per hour, the hourly rainfall excesses were determined from the 24 hour PDS. The computed PDS rainfall amounted to 14.75 inches and the resulting rainfall excess totalled 13.55 inches. A tabulation of the hourly rainfall excess, rearranged to provide critical runoff, is shown in Table No. 1.

TABLE NO. 1

PROJECT DESIGN STORM

Time (hours)	Rainfall (Inches)	Rainfall Excess (inches)
0	0	0
1	.06	.01
2	.07	.02
3	.09	.04
4	.12	.07
5	.13	.08
6	.15	.10
7	.20	.15
8	.42	.37
9	.74	.69
10	.96	.91
11	1.64	1.59
12	6.31	6.26
13	1.30	1.25
14	.78	.73
15	.73	.68
16	.24	.19
17	.16	.11
18	.14	.09
19	.13	.08
20	.10	.05
21	.09	.04
22	.07	.02
23	.06	.01
24	.06	.01
	14.75	13.55

b. Unit Hydrographs - The adopted unit hydrograph for design of the Sucker Brook Project was utilized to develop the Project Design Flood on its watershed. In addition, it served as a basis for development of the unit hydrographs for Highland Lake peripheral watershed and the Lake surface. The adopted unit hydrographs for the respective areas are contained in Table No. 2.

TABLE NO. 2

ADOPTED UNIT HYDROGRAPHS

Time	Sucker Brook D.A. = 3.43 sq.mi.	Highland Lake Periphery D.A. = 2.78 sq.mi.	Highland Lake Surface D.A. = 0.70 sq.mi.
(hours)	(cfs)	(cfs)	(cfs)
0	0	0	0
1	135	109	28
2	430	348	88
3	445	360	91
4	315	255	64
5	210	170	43
6	150	122	31
7	110	89	22
8	83	67	17
9	60	48	12
10	47	38	10
11	35	28	7
12	25	20	5
13	15	12	3
14	7	6	1
15	2	2	0

c. Flood Hydrographs - The Project Design Flood hydrographs were computed by applying the PDS rainfall excess to the adopted unit hydrographs for the watersheds of Sucker Brook, Highland Lake peripheral area and Highland Lake surface respectively. The flood hydrographs for these watershed are shown on Plates No. 3 and No. 4.

d. Highland Lake Project Design Flood - The inflow hydrograph for Sucker Brook was routed through the reservoir to obtain the one component of the Highland Lake Project Design Flood Inflow hydrograph. It was assumed that Sucker Brook Reservoir was empty at the start of the flood. The routing resulted in a maximum pool elevation of 938.5 feet, msl, approximately 3.5 feet higher than the Sucker Brook spillway crest elevation at the time of the 1530 cfs peak outflow. (See Plate No. 3.) The PDF inflow to Highland Lake was obtained by combining the outflow hydrograph with the two Highland Lake component hydrographs and is shown on Plate No. 5. The inflow hydrograph has a peak discharge of

4550 cfs with a secondary rise occurring about four hours on the recession side due to the contribution of Sucker Brook during spillway discharge.

e. Highland Lake Flood Routing - The Project Design Flood was routed through Highland Lake to determine the resulting lake level and outflow hydrograph. The routings were based on two conditions:

(1) The starting pool elevation drawn down one foot below normal to elevation 881.3 feet, msl.

(2) The starting pool elevation at 882.3 feet, msl, the elevation of the low point of the easterly overflow section.

Both routings were predicated on the outflow being confined to the present overflow sections of the dam. The results of the routing under the condition (1) indicated a maximum pool elevation of 884.9 feet, msl, with a peak outflow of 2320 cfs. The routing under condition (2) resulted in a maximum pool elevation of 885.0 feet, msl, with a peak outflow of 2710 cfs. On the basis of the small differential in maximum pool elevations and the costs for water rights and construction of a control weir to maintain the lower normal pool elevation, condition (2) was adopted for design of the modifications to Highland Lake Dam. The results of the routings are shown on Plate No. 5. It is noted, by comparison of the hydrographs on Plates No. 3 and No. 5, that the discharge contribution from Sucker Brook Dam is about 1450 cfs at the time of the 2710 cfs peak outflow from Highland Lake.

7. Recommended Modifcations - The recommended plan of modifications incorporates those measures necessary to assure the integrity of Highland Lake Dam during the pool stage and outflow associated with the Project Design Flood. To protect against overtopping due to wind and wave forces, a freeboard of three feet was provided over the maximum pool elevation of 885.0 feet, msl. The resulting elevation of 888.0 feet, msl, will confine the outflow within the outer extremities

of the present two depressed overflow sections discharging into Highland Lake Stream. The plan of modifications, shown on Plate No. 2, includes the following:

a. Westerly Abutment - Approximately 300 feet of low dike will be constructed from high ground northerly of West Lake Street extending to the knoll east of the Laurel Lodge Club. Approximately 260 feet of the dike will be constructed from the easterly side of the same knoll returning to West Lake Street at the westerly edge of the overflow sections. Top width will be six feet with side slopes of 2H:1V on the lake side and 3H:1V on the land sides. Dumped rock will be provided on the lake side face of the easterly dike for protection against erosive forces. Two sand bag closures will be provided at West Lake Street.

b. Overflow Section - Heavy cover stone will be placed at the downstream face of the dam to absorb the impact forces of the discharge from the overflow sections. This cover stone will be 2000 lb. stone or larger placed for a distance of 24 feet downstream of the face of the dam. It will consist of a three-foot layer on a two-foot filter bed of quarry run stone. Along the upstream face, additional dumped rock will be placed on the westerly two-thirds of the dam to protect against erosive forces.

c. Easterly Abutment - The modifications will include floodwalls, dikes, raising of East Lake Street and construction of a recreational boat launching ramp to provide protection compatible with existing topographic features and present recreational usage. A sand bag closure will be provided at the extremity of the easterly overflow section. Approximately 200 feet of low concrete floodwall will extend from the easterly overflow section to the boat launching ramp. The ramp will consist of compacted fill with a bituminous paving and dumped rock protection on the side slopes. Approximately 200 feet of dike will be constructed from the boat launching ramp easterly tying into East Lake Street. Dumped rock protection will be provided along the face of dike where exposed to direct wave action. East Lake Street will be raised on a three percent grade from the intersection with Lake Street extending easterly approximately 230 feet and thence at a level grade 170 feet easterly to tie to existing topography at elevation 888.0 feet, msl.

d. Hurlbut and East Lake Streets - To preclude overflow through the low topographic saddle, 295 feet of low dike will be constructed in the beach area tying to high ground at each extremity. The dike will be of compacted fill with top soil and seed placed on top and side slopes. The cross section of the dike will consist of a 12-foot top width and side slopes of 4H:1V to facilitate continued use of this bathing area.

8. Estimated Cost - The estimated construction cost of the recommended modifications is ninety two thousand dollars ($92,000) exclusive of land acquisition, engineering, utility relocation and administration. The estimated construction costs are summarized in Table No. 3. Although no detailed utility data were collected in this preliminary design investigation, field examination did not disclose the need for major utility relocation. As the recommended modifications will be beneficial to local residents, land acquisition costs are contingent upon successful negotiation. The total non-federal cost of the modifications appears to be within the $150,000 figure contained in House Document No. 443.

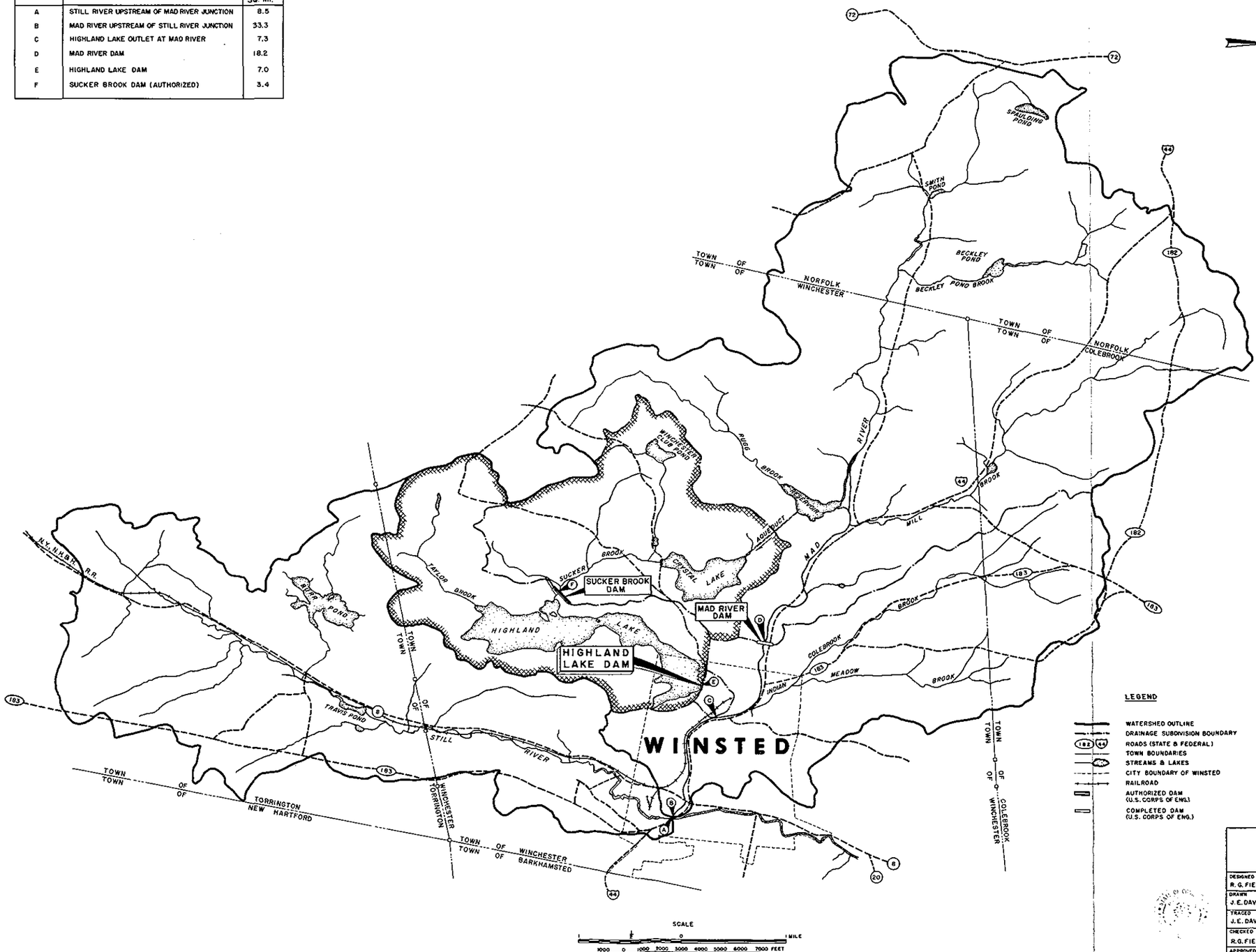
TABLE NO. 3

ESTIMATED CONSTRUCTION COST

Item	Quantity	Unit	Unit Cost	Cost
Site Preparation		L.S.		$ 5,000
Compacted Fill	5,900	C.Y.	$ 2.00	11,800
Concrete	120	C.Y.	100.00	12,000
Structural Excavation	120	C.Y.	4.00	480
Removal of Existing Stone Masonry	40	C.Y.	5.00	200
Bituminous Paving	2,000	S.Y.	3.00	6,000
Removal of Existing Pavement	1,300	S.Y.	1.00	1,300
Raise Manholes	3	Ea.	200.00	600
Curbs	820	L.F.	4.00	3,280
Concrete Walks	280	S.Y.	4.00	1,120
Dumped Rock Protection	1,200	C.Y.	6.00	7,200
Cover Stone	770	C.Y.	25.00	19,250
Quarry Run Stone- Filter	365	C.Y.	10.00	3,650
Topsoil and Seed	3,800	S.Y.	.60	2,280
Clear and Grub		L.S.		2,000
Subtotal				$76,160
Construction Contingencies 20% +				15,840
TOTAL				$92,000 *

*Exclusive of Acquisition, Utilities, Administrative and Engineering Costs.

POINT	LOCATION	D. A. SQ. MI.
A	STILL RIVER UPSTREAM OF MAD RIVER JUNCTION	8.5
B	MAD RIVER UPSTREAM OF STILL RIVER JUNCTION	33.3
C	HIGHLAND LAKE OUTLET AT MAD RIVER	7.3
D	MAD RIVER DAM	18.2
E	HIGHLAND LAKE DAM	7.0
F	SUCKER BROOK DAM (AUTHORIZED)	3.4



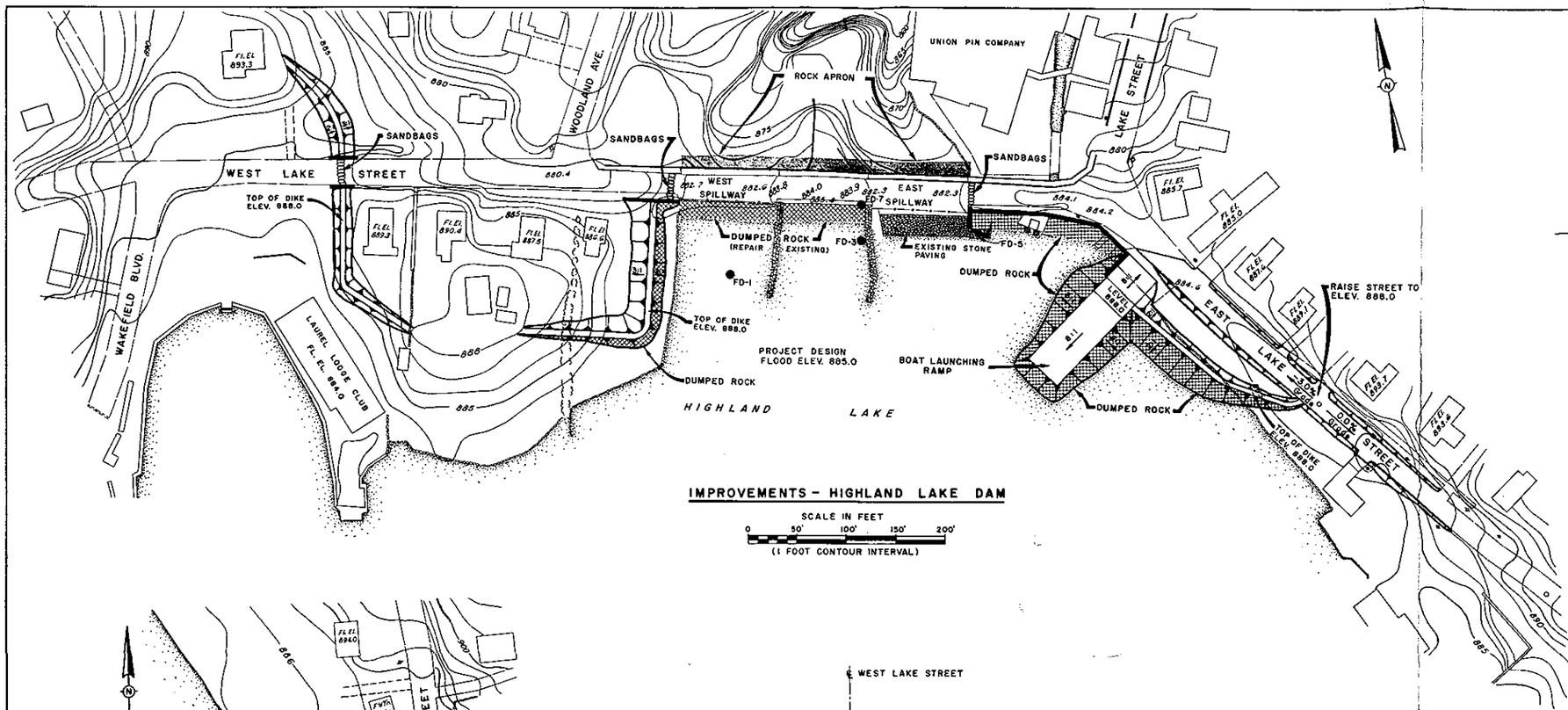
LEGEND

- WATERSHED OUTLINE
- DRAINAGE SUBDIVISION BOUNDARY
- ROADS (STATE & FEDERAL)
- TOWN BOUNDARIES
- STREAMS & LAKES
- CITY BOUNDARY OF WINSTED
- RAILROAD
- AUTHORIZED DAM (U.S. CORPS OF ENG.)
- COMPLETED DAM (U.S. CORPS OF ENG.)

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
WILLIAM S. WISE, DIRECTOR

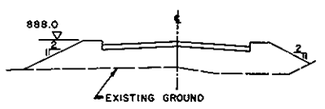
DESIGNED R. G. FIELD	WINSTED, CONNECTICUT
DRAWN J. E. DAVIS	MODIFICATION TO HIGHLAND LAKE DAM WATERSHED MAP
TRACED J. E. DAVIS	
CHECKED R. G. FIELD	
APPROVED J. DEGEN	AGENCY APPROVAL _____ DATE _____
DEWEY & KROPPER CONSULTING ENGINEERS 11 ASYLUM ST. HARTFORD, CONN.	SCALE AS SHOWN W-102 SHEET 1 OF 2

PLATE NO. 1



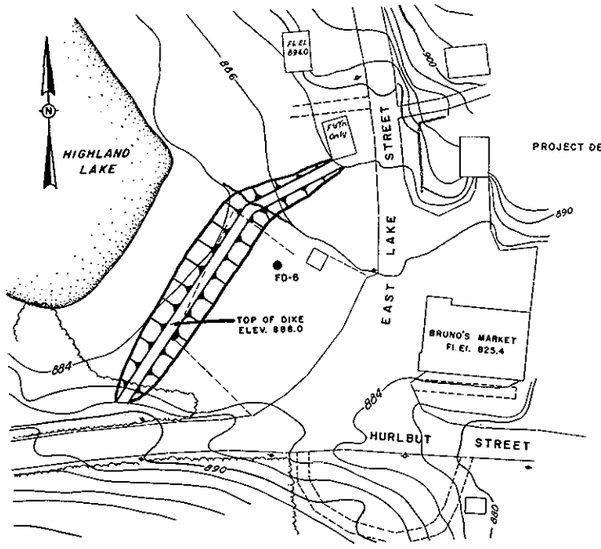
IMPROVEMENTS – HIGHLAND LAKE DAM

SCALE IN FEET
0 50' 100' 150' 200'
(1 FOOT CONTOUR INTERVAL)



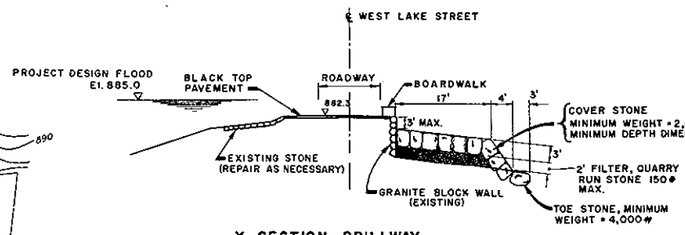
TYPICAL ROAD SECTION

NOT TO SCALE



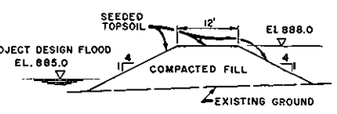
DIKE @ EAST LAKE & HURLBUT STREETS

SCALE IN FEET
0 50' 100' 150' 200'
(2 FOOT CONTOUR INTERVAL)



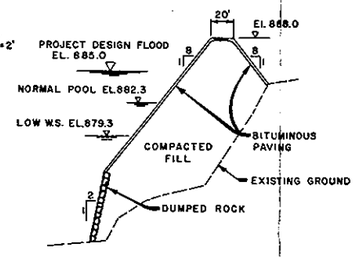
X-SECTION SPILLWAY

NOT TO SCALE



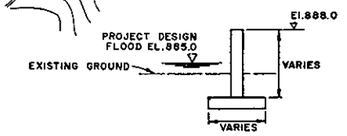
DIKE – HURLBUT & EAST LAKE STREETS

NOT TO SCALE



PROFILE – BOAT LAUNCHING RAMP

NOT TO SCALE



TYPICAL WALL SECTION

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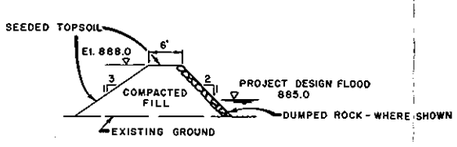


TYPICAL DIKE SECTION

NOT TO SCALE

NOTES:

1. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.
2. TOPOGRAPHY OBTAINED FROM N.E.D., CORPS OF ENGINEERS MAP DATED 9/16/64.
3. LOCATION OF BORINGS (FD-1 ●) FURNISHED BY CORPS OF ENGINEERS. SEE PLATE NO. 6 FOR BORING LOGS.

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
WILLIAM S. WISE, DIRECTOR

DESIGNED R. G. FIELD	WINSTED, CONNECTICUT
DRAWN J. E. DAVIS	MODIFICATION TO HIGHLAND LAKE DAM
TRACED J. E. DAVIS	
CHECKED R. G. FIELD	
APPROVED J. DEGEN	AGENCY APPROVAL _____ DATE _____

DEWEY & KROPPER
CONSULTING ENGINEERS
11 ASYLUM ST. HARTFORD, CONN.

SCALE AS SHOWN
W-102
SHEET 2 OF 2

PLATE NO. 2

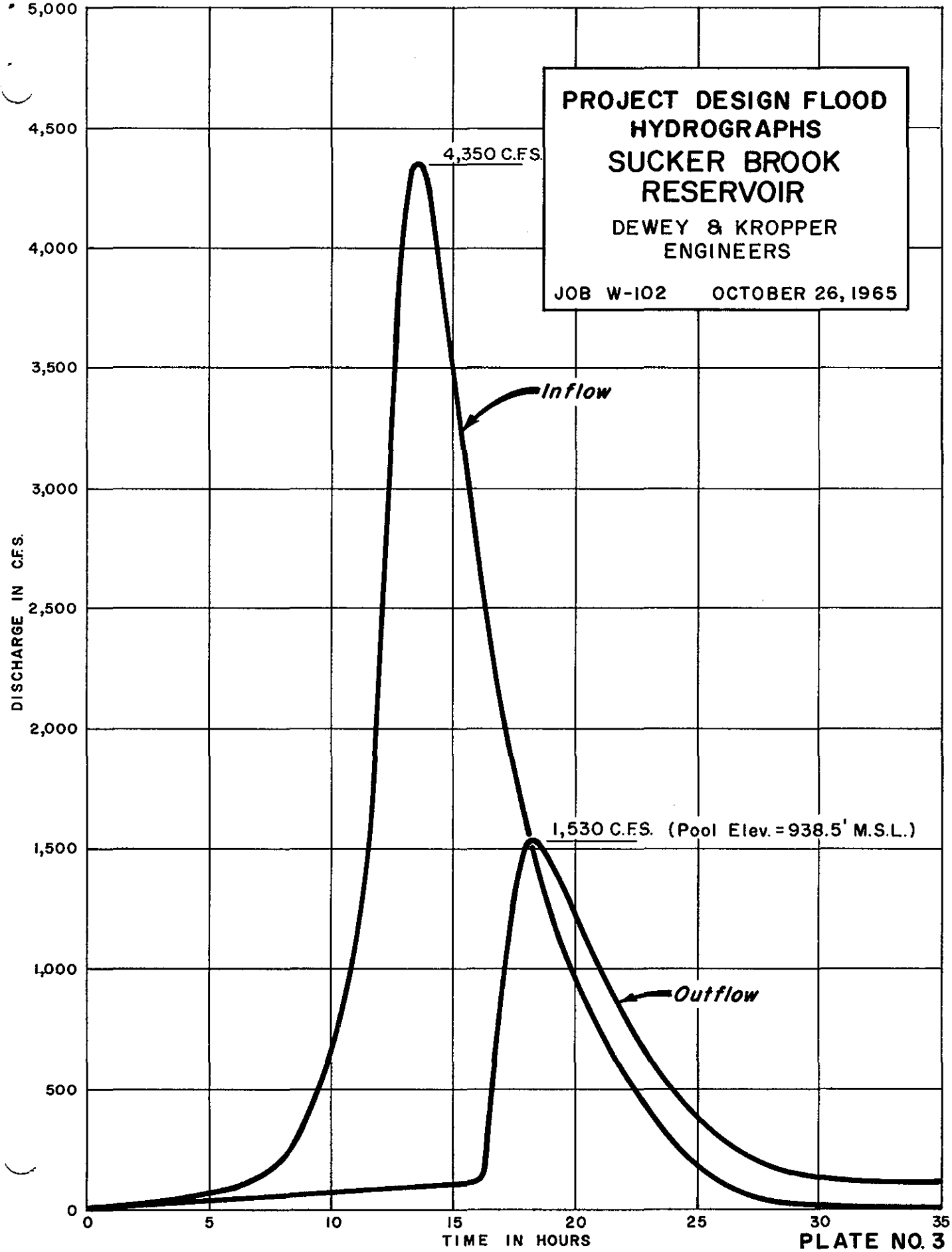

PROJECT DESIGN FLOOD HYDROGRAPHS
SUCKER BROOK RESERVOIR
DEWEY & KROPPER ENGINEERS
JOB W-102 OCTOBER 26, 1965
4,350 C.F.S.
Inflow
1,530 C.F.S. (Pool Elev. = 938.5' M.S.L.)
Outflow
DISCHARGE IN C.F.S.
TIME IN HOURS
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
0
5
10
15
20
25
30
35

PLATE NO. 3

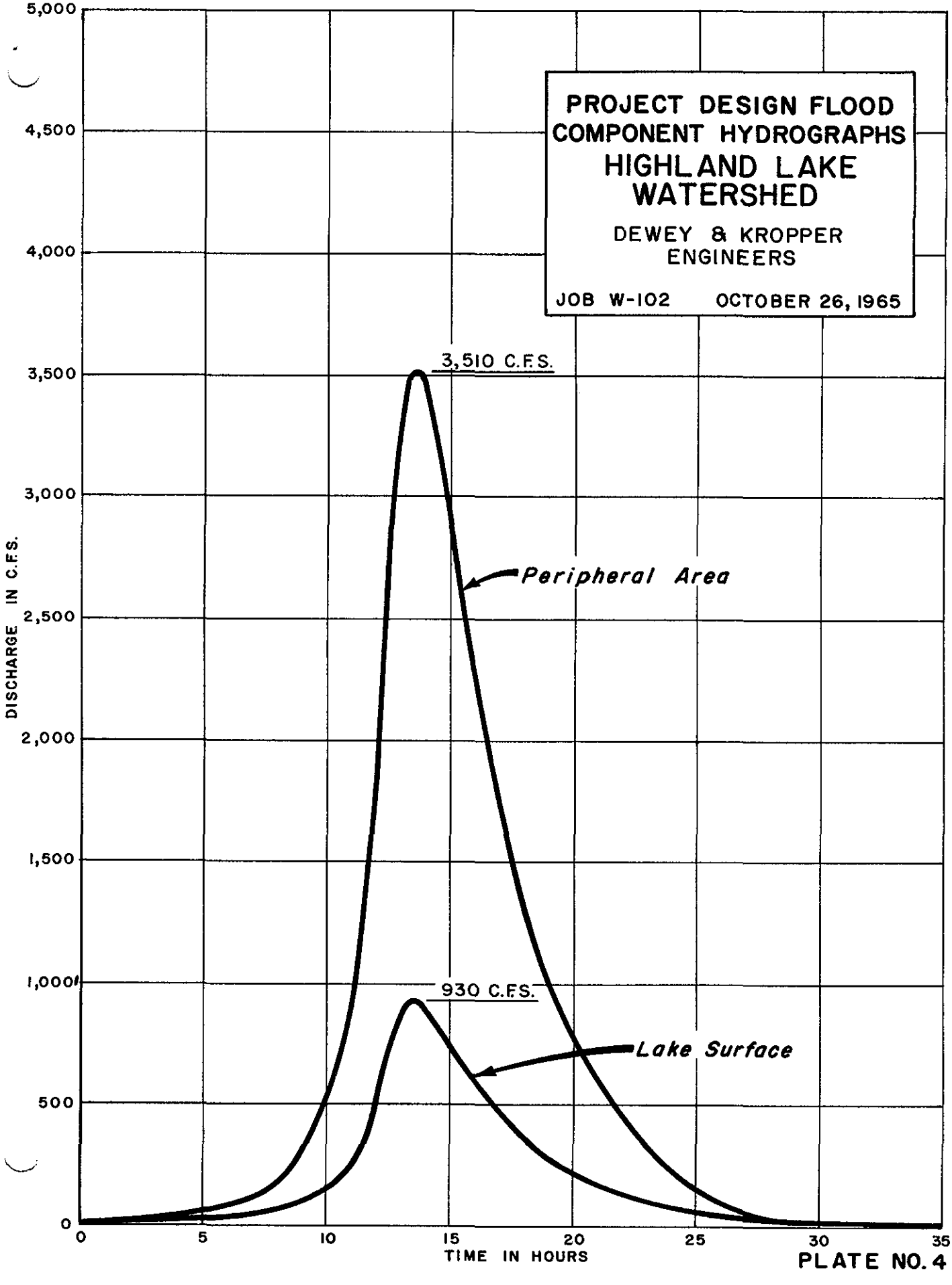

PROJECT DESIGN FLOOD
COMPONENT HYDROGRAPHS
HIGHLAND LAKE
WATERSHED
DEWEY & KROPPER
ENGINEERS
JOB W-102 OCTOBER 26, 1965
3,510 C.F.S.
Peripheral Area
930 C.F.S.
Lake Surface
DISCHARGE IN C.F.S.
TIME IN HOURS
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
5
10
15
20
25
30
35

PLATE NO. 4

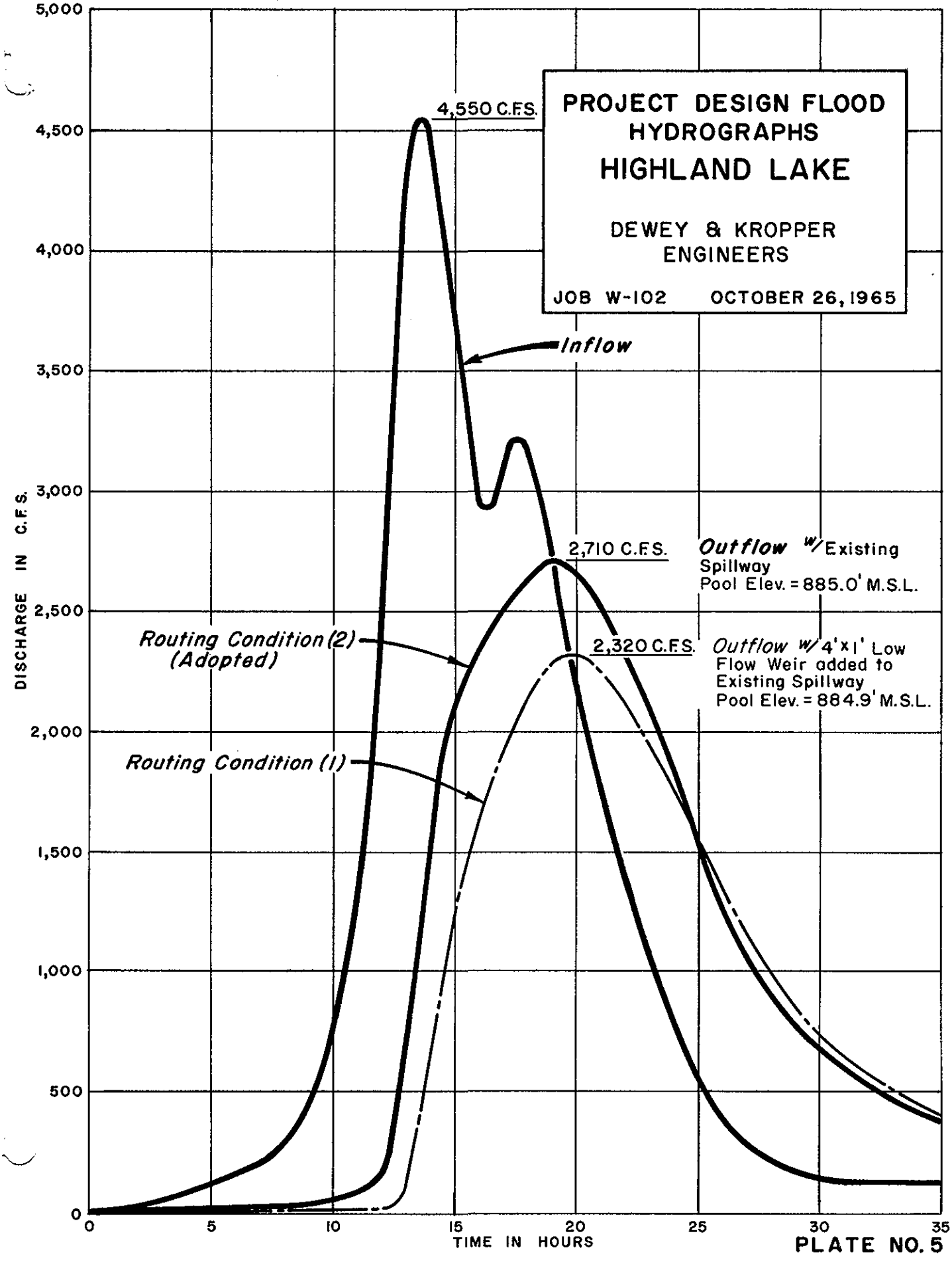
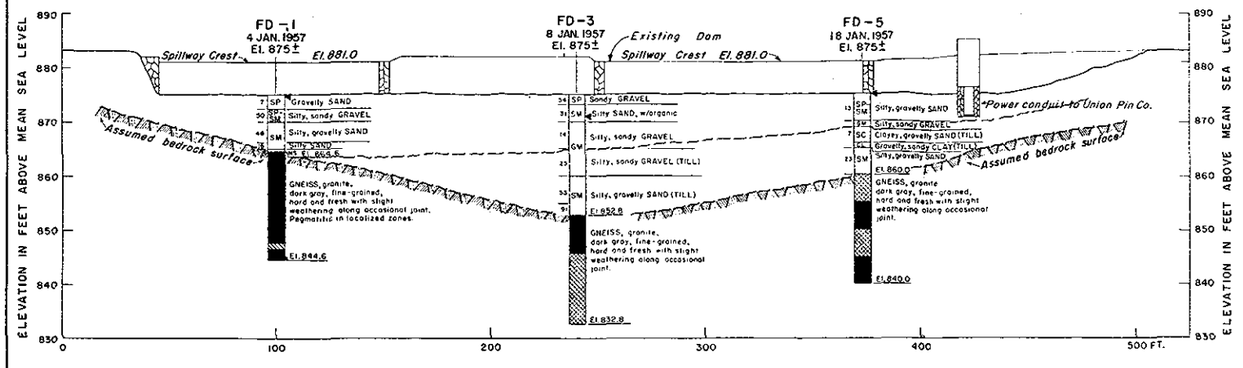

PROJECT DESIGN FLOOD HYDROGRAPHS
HIGHLAND LAKE
DEWEY & KROPPER ENGINEERS
JOB W-102 OCTOBER 26, 1965
4,550 C.F.S.
Inflow
2,710 C.F.S.
Outflow w/ Existing Spillway Pool Elev. = 885.0' M.S.L.
Routing Condition (2) (Adopted)
2,320 C.F.S.
Outflow w/ 4'x1' Low Flow Weir added to Existing Spillway Pool Elev. = 884.9' M.S.L.
Routing Condition (1)
DISCHARGE IN C.F.S.
TIME IN HOURS
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
5
10
15
20
25
30
35

PLATE NO. 5

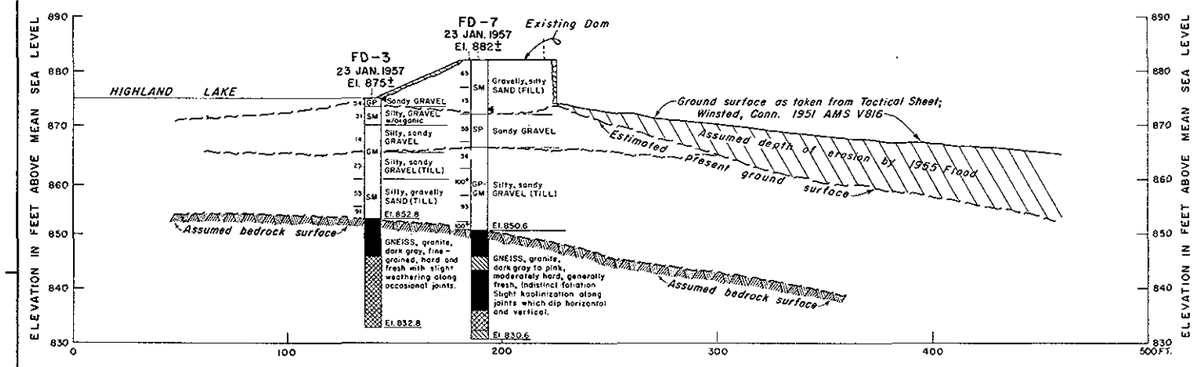
CORPS OF ENGINEERS

U.S. ARMY



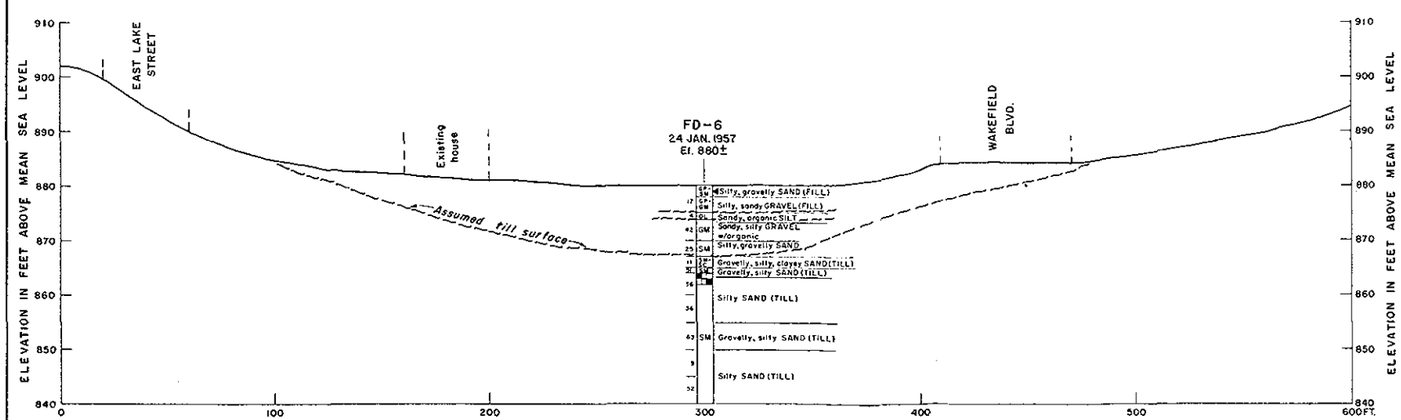
GEOLOGIC - LOG PROFILE A-A, AT EXISTING SPILLWAY (AREA-1)

(LOOKING NORTH)



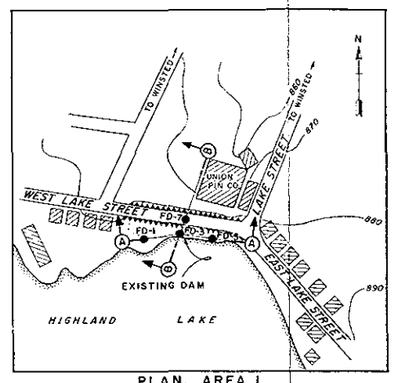
GEOLOGIC - LOG PROFILE B-B, THROUGH EXISTING SPILLWAY (AREA-1)

(LOOKING WEST)



GEOLOGIC - LOG PROFILE C-C, LOW SADDLE AT EAST ARM OF LAKE (AREA-2)

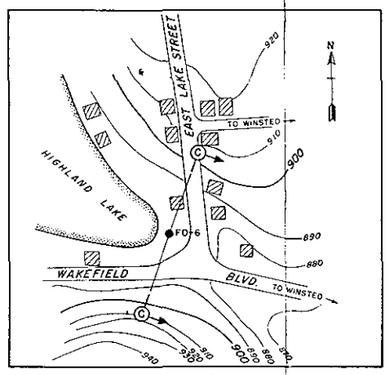
(LOOKING EAST)



PLAN, AREA 1

SCALE IN FEET

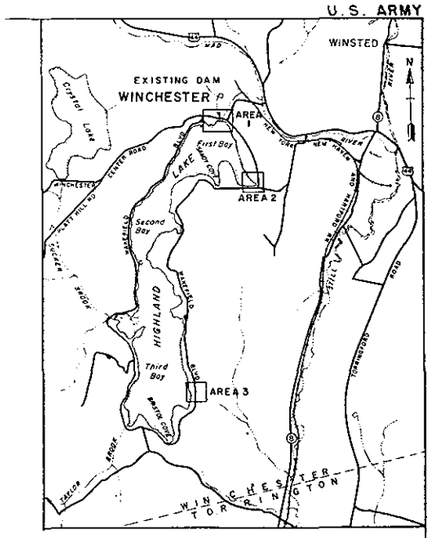
200' 0 200' 400'



PLAN, AREA 2

SCALE IN FEET

200' 0 200' 400'



LOCATION MAP

SCALE IN MILES

0.5 0 1

TYPICAL LEGEND FOR GRAPHIC LOGS

FD-3 Foundation Test Boring.
8 JAN 1957 Date exploration completed.
El. 875± Elevation of ground surface during time of exploration.

Subsurface water level in boring at time of exploration.

SM Group letter symbol according to Unified Soil Classification System.

NR No Recovery or unsatisfactory soil samples recovered.

NS Not Sampled (Core-drilled, blasted and/or washed-bored).

20 Blows per foot of penetration considered most representative, usually within a 5-foot drive using a 350 pound hammer with a free fall of about 18 inches on a 2" or 3" O.D. size sample spoon equipped with bevelled and sharpened drive shoe.

* Blow count not recorded or not considered representative.

Cobble or boulder (Core-drilled)

Cobbles or boulders, continuous or nested. (Core-drilled and/or blasted and chopped)

El. 852.8 Elevation of bedrock surface

Rock core recovery 0 - 25 %

Rock core recovery 25 - 50 %

Rock core recovery 50 - 75 %

Rock core recovery 75 - 90 %

Rock core recovery 90 - 100 %

El. 832.8 Elevation of bottom of exploration.

NOTES

Elevations refer to Mean Sea Level Datum.

Contour interval is 10 feet.

Topography taken from U.S. Geological Survey, Winsted Quadrangle, Connecticut. No surveys have been made and Locations of explorations are approximate.

CORPS OF ENGINEERS
WALTHAM, MASS.

PREPARED BY M.A.V.
DRAWN BY R.C.S.
CHECKED BY R.C.G.
CHIEF, N.E.D. LABORATORIES
PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
FARMINGTON RIVER BASIN
HIGHLAND LAKE
GEOLOGY
STILL RIVER CONNECTICUT
APRIL 1958

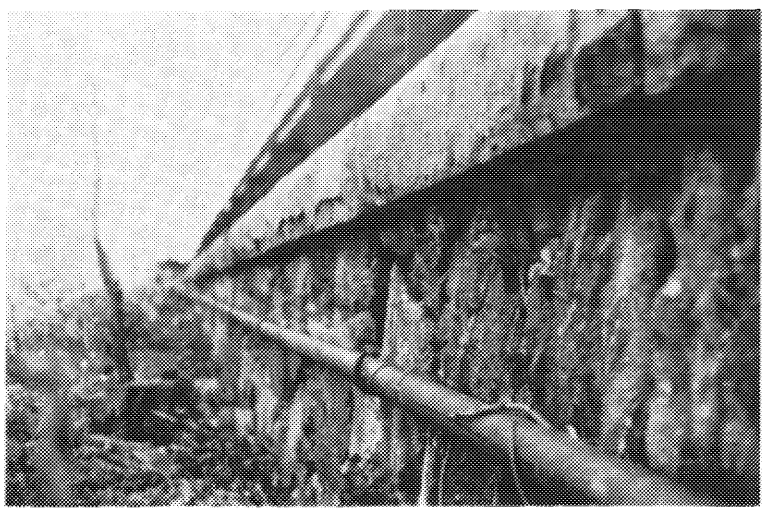
SCALE AS NOTED

TO ACCOMPANY REPORT
DATED: 31 DEC., 1958

CT-1-5537

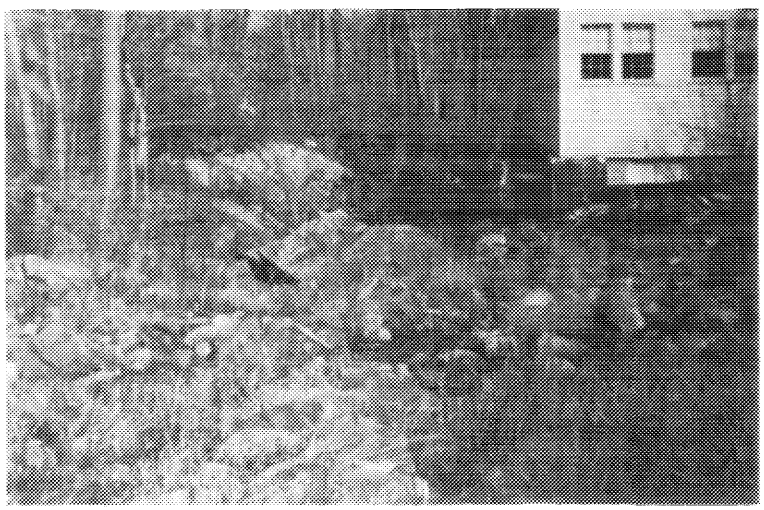
PLATE NO. 6

Downstream Face Of West Spillway. Note Vegetation And Absence Of Rock Splash Apron. 11/3/65



Downstream Face Of West Spillway Showing Condition Of Wall And Overhang Of Capstones. 11/3/65

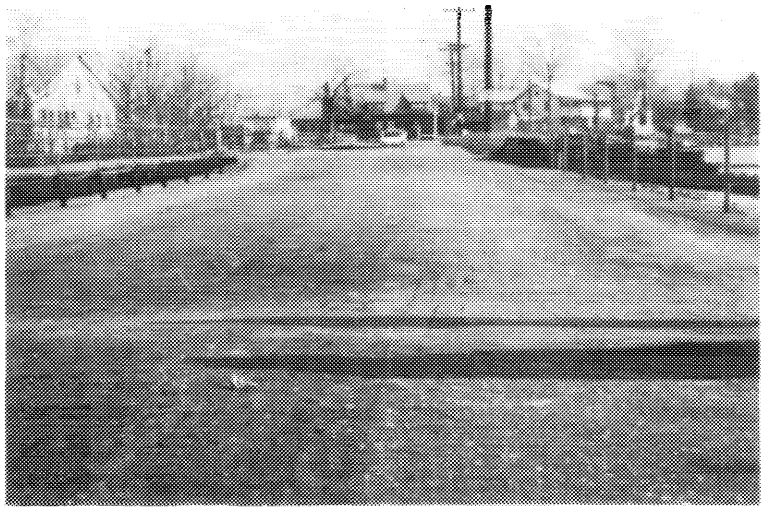
Looking Downstream Along East Spillway's Exit Channel Adjacent To Union Pin Company Building At Intersection Of Both Spillway Exit Channels. Note Size And Extent Of Rock. 11/3/65



Looking Downstream Along East Spillway's Exit Channel Adjacent To Union Pin Company Building At Intersection Of Both Spillway Exit Channels. Note Size And Extent Of Rock. 11/3/65

Upstream Face Of Highland Lake Dam - West Spillway In Foreground - Union Pin Company At Upper Left. 11/3/65

Looking Easterly From Centerline Of West Spillway Along Upstream Face Of Highland Lake Dam - East Lake Street Property In Background. 11/3/65



Looking Easterly Along Centerline Of Dam - Note Two Depressed Sections Of Roadway Serving As Overflow Spillways - Union Pin Building At Left Edge Of Photograph. 11/3/65

Intersection Of West Lake Street And Woodland Avenue - Looking West From Edge Of West Spillway At Low Elevation Of The Roadway Intersection. 11/3/65

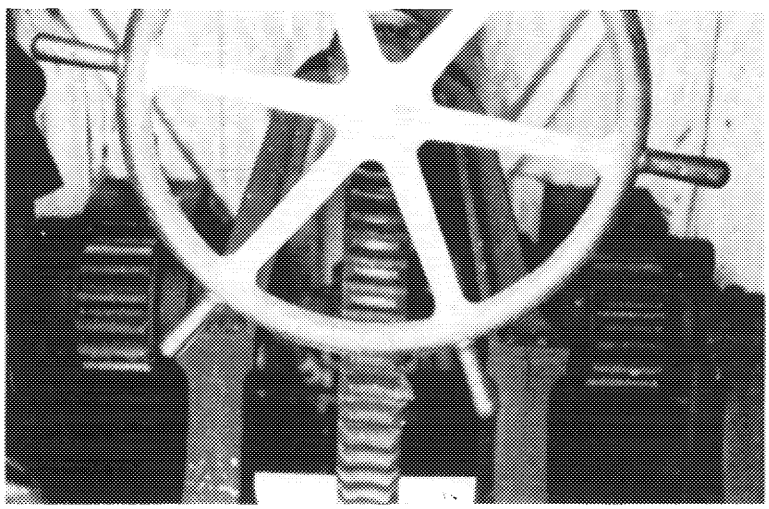
Location Of Proposed Dike At East Lake And Hurlbut Streets At Left Hand Edge Of Photograph. 11/3/65

Building Fronting On East Lake Street In Vicinity Of Proposed Dike At Southeast Corner Of Highland Lake. 11/3/65

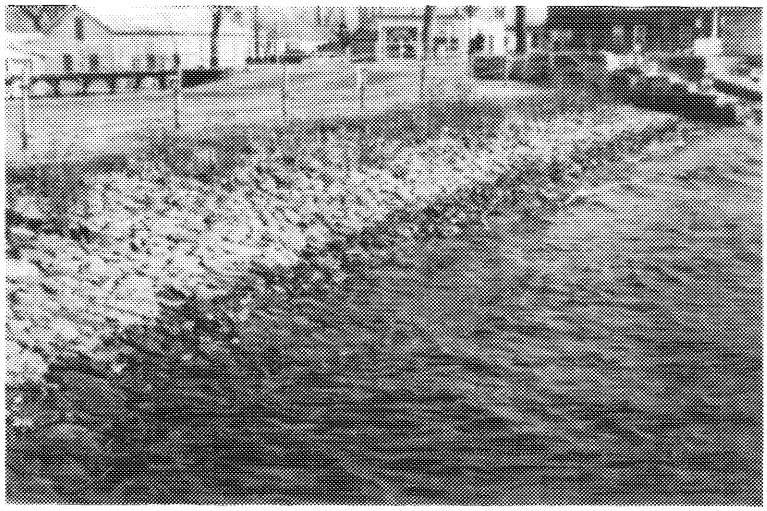
Looking Downstream At East Spillway Exit Channel Adjacent To Union Pin Company Building. 11/3/65

Looking Downstream At West Spillway Exit Channel. 11/3/65

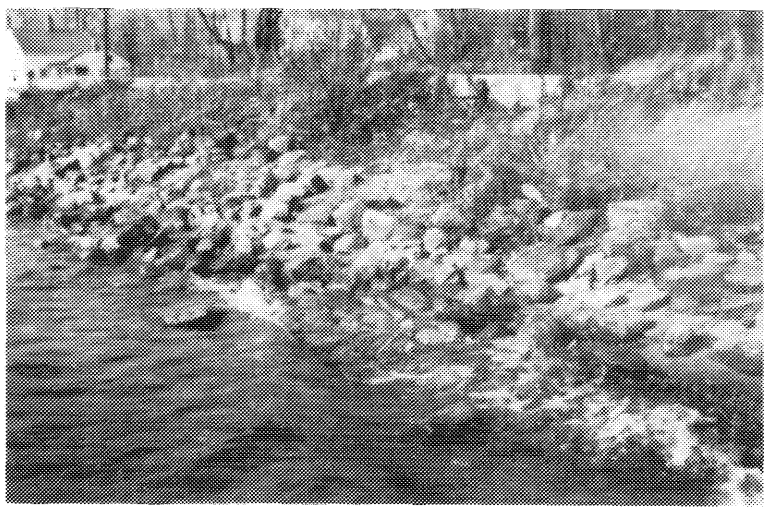
Gate House And Entrance Structure With Trash Racks. Boat Launching Ramp And Dock In Right Background. 11/3/65



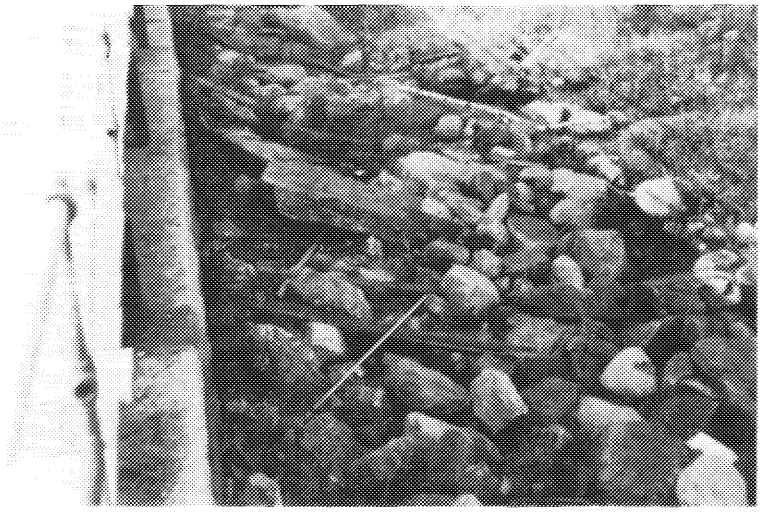
Inside Of Gate House. 11/3/65



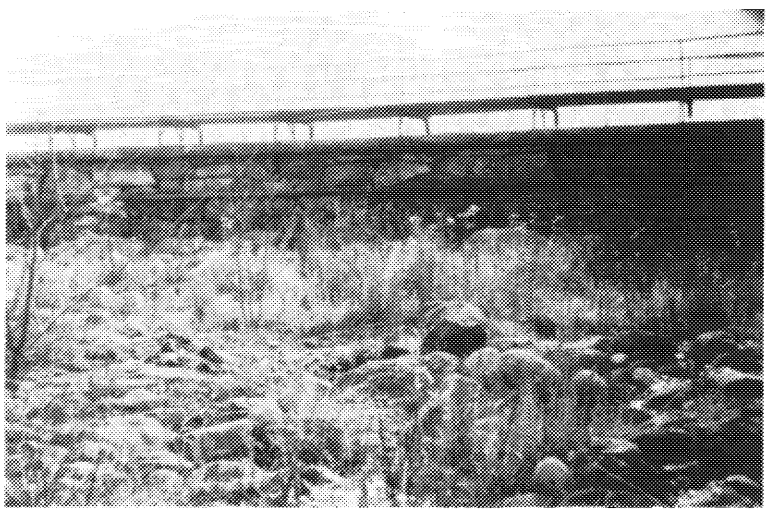
East Spillway's Upstream Face Showing Present Good Condition Of Stone Paving - Gate House For Union Pin Company Withdrawals In Upper Right Hand Corner Of Photograph. 11/3/65



Upstream Face Of Highland Lake Dam Showing Condition Of Stone Facing Of The Center Section Of Dam Between The Two Spillways. 11/3/65

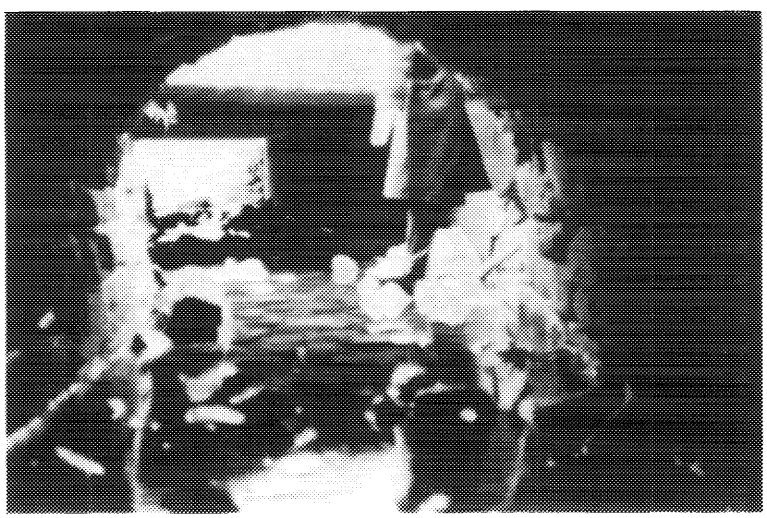


Downstream Toe Of East Spillway Showing Boardwalk, Granite Cap Of Stone Masonry Wall And The Present Splash Apron Of Miscellaneous Stone. 11/3/65



Looking Upstream At East Spillway's Stone Masonry Wall And Boardwalk. 11/3/65

Outlet Of Conduit Through Highland Lake Dam At East Abutment Which Provides Water To Union Pin Company - Looking Upstream Control Gate Closed. 11/3/65



Looking Downstream From Inside Of Conduit Through Highland Lake Dam - Note Access Bridge To Union Pin Company. 11/3/65